Birthday paradox and coupon count problem

The following results are not far from the expected results
For the coupon count problem to prove the formula MLogM where M is the coupon count

This are the result

10000.0
number of hashes/throws after when all bins/slots are filled: 107506
Expected hashes before all the slots are filled: 92103.40371976183

20000.0
number of hashes/throws after when all bins/slots are filled: 207027
Expected hashes before all the slots are filled: 198069.75105072255

30000.0
number of hashes/throws after when all bins/slots are filled: 320921
Expected hashes before all the slots are filled: 309268.5798193288

40000.0
number of hashes/throws after when all bins/slots are filled: 426158
Expected hashes before all the slots are filled: 423865.3893238429

50000.0
number of hashes/throws after when all bins/slots are filled: 558726
Expected hashes before all the slots are filled: 540988.9142205141

60000.0
number of hashes/throws after when all bins/slots are filled: 627334
Expected hashes before all the slots are filled: 660125.9904722543

70000.0
number of hashes/throws after when all bins/slots are filled: 788257
Expected hashes before all the slots are filled: 780937.5364722047

80000.0
number of hashes/throws after when all bins/slots are filled: 917422
Expected hashes before all the slots are filled: 903182.5530924815

90000.0
number of hashes/throws after when all bins/slots are filled: 1052568
Expected hashes before all the slots are filled: 1026680.8454381161

100000.0
number of hashes/throws after when all bins/slots are filled: 1180889
Expected hashes before all the slots are filled: 1151292.546497023

```
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```
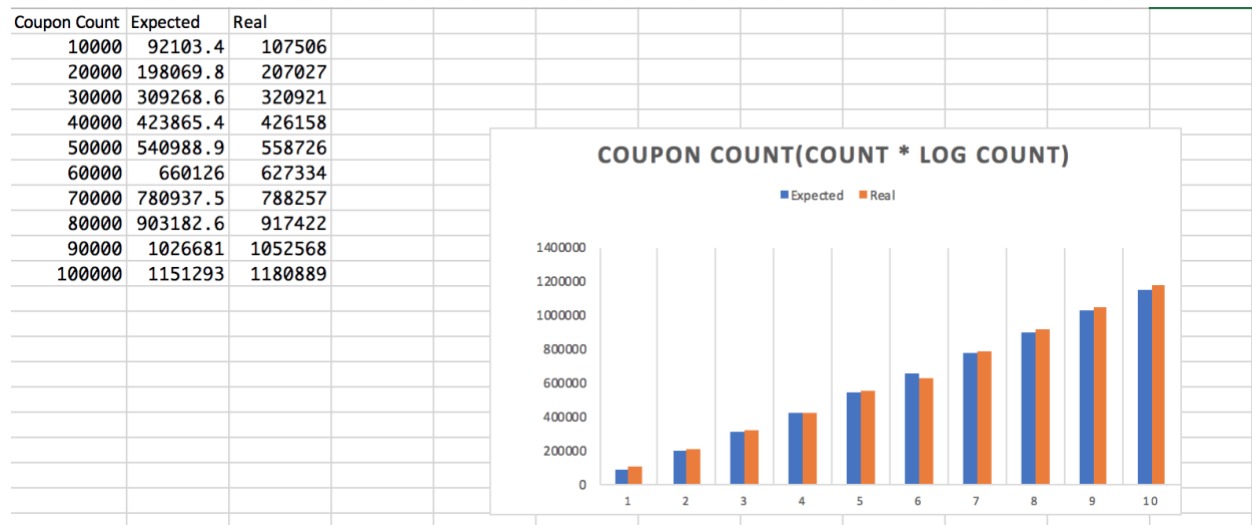
As you can see that the Expected hashes before all slots are filled and actual are not far off

Coupon Count	Expected	Real
10000	92103.4	107506
20000	198069.8	207027
30000	309268.6	320921
40000	423865.4	426158
50000	540988.9	558726
60000	660126	627334
70000	780937.5	788257
80000	903182.6	917422
90000	1026681	1052568
100000	1151293	1180889

COUPON COUNT(COUNT * LOG COUNT)

For birthday problem results are as follows

```
slot count: 10000
number of hashes when the fist collision: 141
expected number of hashes before the fist collision: 125.29964086141668

slot count: 20000
number of hashes when the fist collision: 191
expected number of hashes before the fist collision: 177.2004514666935

slot count: 30000
number of hashes when the fist collision: 211
expected number of hashes before the fist collision: 217.02534414210706

slot count: 40000
number of hashes when the fist collision: 258
expected number of hashes before the fist collision: 250.59928172283335

slot count: 50000
number of hashes when the fist collision: 321
expected number of hashes before the fist collision: 280.178514522438

slot count: 60000
number of hashes when the fist collision: 259
expected number of hashes before the fist collision: 306.9201850644561

slot count: 70000
number of hashes when the fist collision: 352
expected number of hashes before the fist collision: 331.5116890850155

slot count: 80000
number of hashes when the fist collision: 358
expected number of hashes before the fist collision: 354.400902933387

slot count: 90000
number of hashes when the fist collision: 453
expected number of hashes before the fist collision: 375.89892258425004

slot count: 100000
number of hashes when the fist collision: 417
expected number of hashes before the fist collision: 396.23225512317896
```

Solts Count	Expected	Real
10000	125.2996	141
20000	177.2005	191
30000	217.0253	211
40000	250.5993	258
50000	280.1785	321
60000	259	259
70000	331.5117	352
80000	354.4009	358
90000	375.8989	453
100000	396.2323	417

SLOTS(MATH.SQRT(3.14*SLOTS/2)

■ Expected ■ Real